



# Lunar Workshops for Educators: A Unique Offering of NASA Education and Public Outreach

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## Overview

The Lunar Reconnaissance Orbiter (LRO) Lunar Workshops for Educators (LWEs) are a series of 5-day professional development workshops designed to teach science teachers about lunar science and exploration, sponsored by the LRO mission.

Workshop participants learn about recent lunar discoveries, reinforce their understanding of lunar science concepts, learn tools to address common student misconceptions, interact with lunar scientists and engineers, work with LRO data, and learn how to bring these data and information to their students using inquiry-based, hands-on activities aligned with the Next Generation Science Standards.

The LWEs are designed based on best practices outlined in pedagogical research of science education, and facilitators model instructional best practices throughout the trainings. Activities are facilitated as if the teachers are middle school students, and then discussed on an educator level. Reflective tools and metacognitive exercises help facilitate learning and make the learning process more apparent to the participants.

The week-long trainings take place in the summer. The LRO Education and Public Outreach (E/PO) team follows up with the participants throughout the following school year to keep participants informed of new science results and activities, answer questions, provide opportunities for participant discussions, and monitor progress as participants incorporate workshop information and materials into their classrooms.



Workshop participants engaged in hands-on activities. Bottom left: Participants use a variety of data sets, activities, and a cantaloupe to investigate the formation and evolution of the Moon. Top left: Teachers learn about impact crater scaling relations using water balloons. Top right: Participants learn about volcano formation by simulating volcanic eruptions, creating geologic maps, and collecting core samples.



## 4 Years of Workshops

The LRO E/PO Team has led LWEs around the country each summer since 2010. 2013 marked a shift in the previous LWE model, based on recommendations from the NASA Education Design Team (2011). Because of a recommendation to focus on middle school teacher professional development, the LWEs were restricted to grade 6–9 science teachers, instead of grade 6–12 science teachers. All workshops were held at NASA Goddard Space Flight Center (GSFC) in Greenbelt, MD, in order to build upon a local partnership with the GSFC Office of Education.

The grade restriction received positive feedback from participants. Teachers enjoyed doing the activities and participating in discussions with other teachers with whom they could directly relate, and who work with similar ages and levels of students.

The 2013 LWEs had a higher cancellation rate than any previous year, in large part because of funding restrictions. Teachers who were promised travel compensation by their school districts in order to attend the workshop at GSFC were later told that the funding was no longer available. If workshops continue to be held at GSFC, travel stipends for teachers could alleviate this problem.



John Keller, the LRO Project Scientist, discusses LRO's latest science results with LWE teachers.

## Evaluation

The LWEs are evaluated by an external evaluation team at the Planetary Science Institute in Tucson, AZ. Evaluation results indicate that the LWEs are an effective professional development experience for teachers. In the most recent evaluation report, 2012 participants increased in their overall knowledge of lunar science and exploration and found information, resources, new teaching techniques, and confidence in teaching their students about lunar science and exploration. Additionally, participants' feelings about the workshop and presenters were overwhelmingly positive.

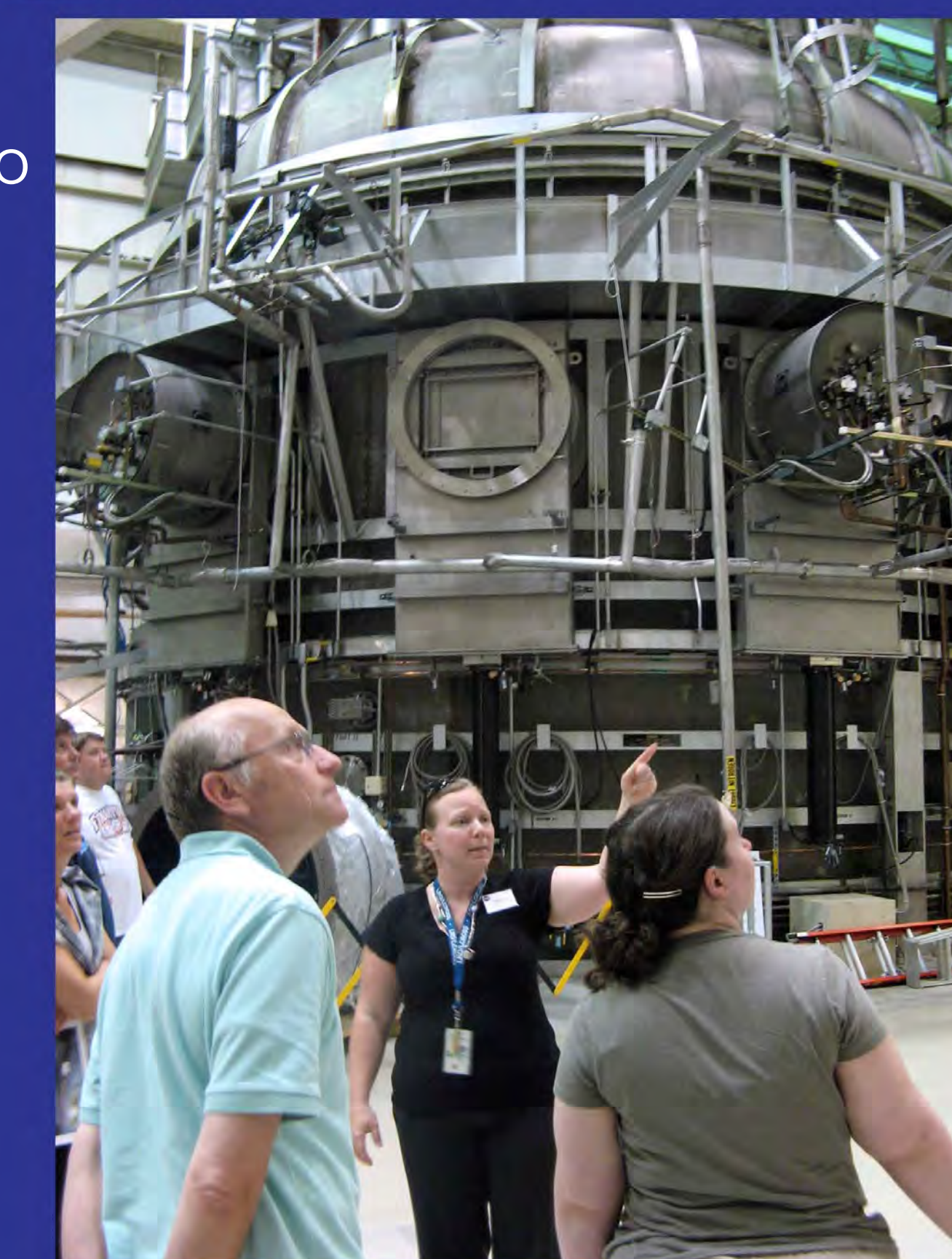
## A Unique Offering of NASA E/PO

The LWEs are an effective model of teacher professional development because of the resources that support this program. The LRO E/PO Team meets regularly with the LRO Project and Science Team, and so can meaningfully and effectively integrate LRO scientists and engineers into the workshops. The LRO E/PO Team also participates in professional science conferences, so E/PO Team members stay updated on the latest science results and discussions and can interpret and translate this information into audience-appropriate formats. The LRO E/PO Team has access to data that are incorporated into workshop activities, and regularly meets with the LRO Visualization Team and is able to recommend visualization topics of interest to teachers.

Importantly, the LWEs and all NASA E/PO products and programs are backed by the powerful NASA brand, known for its exciting and inspiring content. Successful NASA E/PO activities, such as the LWEs, provide further support to the NASA brand and continue to fuel America's interest in and understanding of Science, Technology, Engineering, and Math (STEM) concepts.



Right: Brooke Hsu, the LRO E/PO Lead, takes participants on a tour of the facilities at GSFC where LRO was built, integrated, and tested. The tour also includes a trip to the LRO Mission Operations Center.



**For More Information, Visit:**

<http://lunar.gsfc.nasa.gov/lwe/index.html>